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PATENT APPLICATION

ATTORNEY DOCKET NO. 10017556-1

IN THE
UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor(s): Richard P. Tarquini

Confirmation No.: 2797

Application No.: 10/002,381

Examiner: Cam Y T Truong

Filing Date: 10/31/2001

Group Art Unit: 2162

Title: System and Method for Searching a Signature Set for a Target Signature

Mail Stop Appeal Brief-Patents
Commissioner For Patents
PO Box 1450
Alexandria, VA 22313-1450

TRANSMITTAL OF APPEAL BRIEF

Sir:

Transmitted herewith is the Appeal Brief in this application with respect to the Notice of Appeal filed on **01/28/2005**.

The fee for filing this Appeal Brief is (37 CFR 1.17(c)) $500.00.

(complete (a) or (b) as applicable)

The proceedings herein are for a patent application and the provisions of 37 CFR 1.136(a) apply.

( ) (a) Applicant petitions for an extension of time under 37 CFR 1.136 (fees: 37 CFR 1.17(a)-(d) for the total number of months checked below:

( )	one month	$120.00
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( ) The extension fee has already been filled in this application.

(X) (b) Applicant believes that no extension of time is required. However, this conditional petition is being made to provide for the possibility that applicant has inadvertently overlooked the need for a petition and fee for extension of time.

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Respectfully submitted,

Richard P. Tarquini

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPEAL FROM THE EXAMINER TO THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re Application of:	Richard P. Tarquini
Serial No.:	10/002,381
Filing Date:	10/31/2001
Group Art Unit:	2162
Examiner:	Cam Y T Truong
Title:	System and Method for Searching a Signature Set for a Target Signature

MAIL STOP: APPEAL BRIEF-PATENTS
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

Dear Sir:

APPEAL BRIEF

Applicant has appealed to the Board of Patent Appeals and Interferences from the decision of the Examiner mailed December 13, 2004, finally rejecting Claims 1-20. Applicant filed a Notice of Appeal on January 28, 2005. Applicant respectfully submits herewith this Appeal Brief with authorization to charge the statutory fee of $500.00.

REAL PARTY IN INTEREST

The present application was assigned to Hewlett-Packard Company as indicated by an assignment from the inventor recorded on March 19, 2002 in the Assignment Records of the United States Patent and Trademark Office at Reel 012723, Frame 0907. The present application was subsequently assigned to Hewlett-Packard Development Company, L.P. as indicated by an assignment from Hewlett-Packard Company recorded on March 30, 2003 in the Assignment Records of the United States Patent and Trademark Office at Reel 014061, Frame 0492.

RELATED APPEALS AND INTERFERENCES

There are no known appeals or interferences that will directly affect or be directly affected by or have a bearing on the Board's decision in this pending appeal.

STATUS OF CLAIMS

Claims 1-20 stand rejected pursuant to a Final Office Action mailed December 13, 2004. Claims 1-20 are presented for appeal.

STATUS OF AMENDMENTS

No amendments have been filed subsequent to the mailing of the Final Office Action.

SUMMARY OF INVENTION

Independent Claim 1

Embodiments of the present invention as defined by independent Claim 1 are directed toward a lexical search tree data structure (100) comprising a plurality of linked root nodes (102), at least one branch (104) linked to at least one of said plurality of root nodes (102) where each branch (104) along with the root node (102) to which it is linked represents at least one of a plurality of signatures, a first character of each signature being represented by one of said plurality of root nodes (102), and each branch (104) having one or more leaf nodes (106) linked hierachically to one another where each leaf node (106) represents a character in a signature. (at least at page 4, lines 10-15 and lines 21-22, page 5, lines 6-31, page 6, lines 1-11, and figures 1 and 2).

Independent Claim 11

Embodiments of the present invention as defined by independent Claim 11 are directed toward a method for searching a plurality of signatures stored in a lexical search tree data structure (100) comprising determining a hash value for a target signature, determining a branch (104) associated with a root node (102) of said lexical search tree data structure (100) corresponding to said hash value where said branch (104) along with said root node (102) represents at least one signature of said plurality of signatures and said branch (104) having one or more leaf nodes (106) linked hierarchically to one another where each leaf node (106) represents an element of said at least one signature, and traversing only said branch (104) to find a match between said at least one signature and said target signature. (at least at page 4, lines 10-15 and lines 21-22, page 5, lines 6-31, page 6, lines 1-11, page 9, lines 5-31, page 10, lines 1-25, and figures 1, 2 and 4).

Independent Claim 18

Embodiments of the present invention as defined by independent Claim 18 are directed toward a method for representing a plurality of signatures in a lexical search tree data structure (100) comprising: a) allocating a plurality of root nodes (102), one for each distinct element of said plurality of signatures; b) determining an index value for a signature of said plurality of signatures; c) determining a status of a root node (102) corresponding to said determined index value, said root node (102) being selected from said plurality of root nodes (102) and representing a first element of said signature; d) creating a branch (104) for said root node (102) if said root node (102) has no existing branch (104), said branch (104) having one or more leaf nodes (106) linked hierarchically to one another, each successive leaf node (106) representing a successive element of said signature; e) creating a twig (124) for said root node (102) if said root node (102) has an existing branch (104), said twig (124) linked to one of said leaf nodes (106) and representing a substring of said signature, the first element of said substring being represented by a twig node (108) linked to said one of said leaf nodes (106); and f) repeating steps (b) through (e) for each signature of said plurality of signatures. (at least at page 4, lines 10-15 and lines 21-

32, page 5, lines 6-31, page 6, lines 12-32, page 7, lines 1-31, page 8, lines 1-32, and figures 1, 2 and 3A-3C).

GROUNDS OF REJECTION

1. Claims 1-17 are rejected under 35 U.S.C. §103(a) as being unpatentable in view of U.S. Patent No. 5,319,779 issued to Chang et al. (hereinafter "*Chang*") in view of U.S. Patent No. 5,369,577 issued to Kadashevich et al. (hereinafter "*Kadashevich*").

2. Claims 18-20 are rejected under 35 U.S.C. §103(a) as being unpatentable in view of *Kadashevich*.

ARGUMENT

A. Standard

35 U.S.C. § 103(a)

To establish a *prima facie* case of obviousness under 35 U.S.C § 103, three basic criteria must be met: First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings; second, there must be a reasonable expectation of success; and finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. *In re Vaeck*, 947 F.2d 488, (Fed. Cir. 1991); M.P.E.P. § 2143. The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination. *In re Mills*, 916 F.2d 680 (Fed. Cir. 1990); M.P.E.P. § 2143.01. Moreover, where there is no apparent disadvantage present in a particular prior art reference, then generally there can be no motivation to combine the teaching of another reference with the particular prior art reference. *Winner Int'l Royalty Corp. v. Wang*, 202 F.3d 1340, 1349 (Fed. Cir. 2000).

B. Argument

1. Claims 1-17

Claims 1-17 are rejected under 35 U.S.C. §103(a) as being unpatentable in view of *Chang* in view of *Kadashevich*. Of these claims, Claims 1 and 11 are independent. Applicant respectfully submits that independent Claims 1 and 11 are patentable over the cited references, alone or in the combinations indicated by the Examiner, and thus remaining Claims 2-10 and 12-17 which depend respectively from independent Claims 1 and 11 are also patentable.

Applicant respectfully submits that the Examiner has failed to establish a *prima facie* case of obviousness. For example, Applicant respectfully submits that the proposed combination of references does not teach or suggest all the claim limitations, nor is there any motivation or suggestion to combine reference teachings as proposed by the Examiner. Further, the proposed combination of references teach away from the invention as claimed by Applicant.

In the Final Office Action, the Examiner refers to root page 58 of the three-level B-tree of *Chang* and second level pages of the B-tree of *Chang* pointed to by the root page 58 of *Chang* as illustrated in figure 15A of *Chang* as each being "linked root nodes" (Final Office Action, page 5). Applicant respectfully disagrees. Figure 15A of *Chang* appears to disclose at least a portion of a three-level B-tree where, in response to a query, a root page 58 is first accessed to compare a query signature to each root page entry (*Chang*, column 14, lines 58-64, figure 15A). In response to a match between the query signature and a particular root page entry, a child-page pointer field of that particular root page entry is used to locate its child page (*Chang*, column 14, lines 64-68, figure 15A). Thus, the nodes referred to by the Examiner as being linked are a root page and its corresponding child page, each of which are at different levels of the B-tree structure. The Examiner appears to consider the child page of *Chang* as another "root page" ("[r]oot page 58 and another root page of the second level" (Final Office Action, page 5)). However, Applicant respectfully submits that the Examiner's reasoning is counter to the teachings of *Chang* which clearly identifies the linked elements as a "root page" and a "child page," each of

which reside at a different level of the B-tree structure of *Chang*. Thus, by *Chang*'s own teachings, a "child page" is not also a "root page."

Further, in the Final Office action, the Examiner states that "the second level of the three-level B-tree is linked to leaf nodes Zappe and Zilles of Mohan root" (Final Office action, page 5). Applicant respectfully disagrees. As discussed above, *Chang* discloses that in response to a match between a query signature and a particular root page entry, a child-page pointer field of that particular root page entry is used to locate its child page, and then the query signature is compared to each entry on the child page (*Chang*, column 14, line 63 to column 15, line 3). Thus, Applicant respectfully submits that "Mohan," "Zappe" and "Zilles" of figure 15A of *Chang* referred to by the Examiner are each separate entries on a child page of the B-tree of *Chang*. Accordingly, Applicants respectfully submit that the "Mohan," "Zappe" and "Zilles" entries on the child page of the B-tree of *Chang* are not "linked" as suggested by the Examiner.

The Examiner also appears to consider the child page entries of *Chang* as a "branch" of the three-level B-tree of *Chang* "having one or more leaf nodes linked hierachically to one another" (Office Action, page 5). Applicant respectfully disagrees. As discussed above, the child page of the second level of the *Chang* B-tree referred to by the Examiner consists of separate child page entries. Thus, the entries on the child page of *Chang* are not "hierachically [linked] to one another" as recited by independent Claim 1.

Additionally, the Examiner appears to indicate that the child entries on the second level of the B-tree of *Chang*, referred to as "leaf nodes" by the Examiner, each represent a signature (Office action, page 6). However, independent Claim 1 of Applicant's present invention recites "each branch having one or more leaf nodes linked hierachically to one another, each leaf node representing a character in a signature" (emphasis added), which *Chang* does not disclose or even suggest. For example, *Chang* appears to disclose that a hash function is used to encode a substring of a record field or text word into a single numeric value within a specified range

where the computed number identifies a bit position in a leaf signature that is set to "1" (*Chang*, column 6, lines 23-28). For example, *Chang* discloses:

> A leaf signature S1 is formed by setting the indicated bits after the hashing function is applied to field substrings. Field substrings consist of adjoining 3-letter sequences of field values or words in the record. . . . The Harrison hashing algorithm computes a number based on each 3-letter sequence, by summing weighted values of each character. . . . When the character values are weighted and summed, the result is then divided by the largest prime number less than the bit length m of the leaf signature S1. The remainder indicates the bit position in leaf signature S1 is to be set to 1. This procedure is repeated for all 3-letter substrings to be hashed in the record field.

(*Chang*, column 8, lines 5-27). Chang also discloses:

> The net result [of the leaf signature generation process] is to encode the data into a much smaller, more compact representation. Records can be searched more efficiently by testing a properly formed leaf signature S1 than by comparing field values in the record.

(*Chang*, column 8, lines 51-55). Thus, the leaf signature of *Chang*, which the Examiner equates with a "leaf node" as claimed by Applicant, clearly does not represent "a character in a signature" as recited by Applicant's independent Claim 1. To the contrary, *Chang* teaches the opposite such that a computed binary signature is used instead of comparing field values in a particular record.

Independent Claim 11 recites, at least in part, "determining a branch associated with a root node of said lexical search tree data structure corresponding to said hash value, said branch along with said root node representing at least one signature of said plurality of signatures, said branch having one or more leaf nodes linked hierarchically to one another, each leaf node representing an element of said at least one signature" and "traversing only said branch to find a match between said at least one signature and said target signature." Thus, for at least any of the reasons discussed above, *Chang* does not disclose or even suggest each and every limitation of independent Claims 1 and 11 as proposed by the Examiner. Further, *Kadashevich* does not remedy any of the deficiencies of *Chang* discussed above. Accordingly, for at least any of these reasons discussed above, the proposed combination of references do not teach or suggest all the claim limitations of independent Claims 1 and 11.

In the Final Office action, the Examiner admits that *Chang* does not explicitly teach "a first character of each signature being represented by one of said plurality of root nodes" as recited by independent 1 (Final Office Action, page 6). However, the Examiner also states that *Kadashevich* teaches that each nodes 30 of the trie is represented by a different character of a stem found in the trie (Office Action, page 3), and that it "would be obvious to a person of ordinary skill . . . to apply *Kadashevich*'s teaching of each nodes 30 of the trie represent[ing] a different character of a stem found in the trie" to *Chang* (Office action, page 3). Applicant respectfully disagrees. As discussed above, *Chang* uses a method of generating various level signatures of a B-tree by hashing sequences or field substrings of a record and using particular bit fields of a binary string representing the signature for searching (e.g., "encod[ing] the data in the record into a much smaller, more compact representation."). Thus, to combine the purported teachings of *Kadashevich* with *Chang* as proposed by the Examiner would result in the *Chang* system/method being inoperable for its intended use as taught by *Chang* at least because *Chang* hashes field substrings, computes a number based on the hashed substring, combines the number values and uses a computed binary signature for searching records. To the contrary, *Chang* teaches away from the combination of references proposed by the Examiner at least because the purpose of *Chang* is to "encode the data into a much smaller, more compact representation" (*Chang*, column 8, lines 51-55), thereby teaching away from a particular node being represented by a character of a signature. Thus, for at least these reasons, there is no motivation or suggestion to combine reference teachings as proposed by the Examiner and, moreover, at least *Chang* teaches away from the proposed combination as suggested by the Examiner.

Accordingly, for at least the above reasons, independent Claims 1 and 11, and Claims 2-10 and 12-17 that depend therefrom, are patentable over the cited references.

2. Claims 18-20

Applicant respectfully submits that Claims 18-20 are separately patentable relative to Claims 1-17. Claims 18-20 are rejected under 35 U.S.C. §103(a) as being unpatentable in view of *Kadashevich*. Of these claims, Claim 18 is independent. Applicant respectfully submits that independent Claim 18 is patentable over the cited reference, and thus remaining Claims 19-20 which depend from independent Claim 18 are also patentable.

Applicant respectfully submits that the Examiner has failed to establish a *prima facie* case of obviousness. For example, Applicant respectfully submits that the cited reference does not teach or suggest all the claim limitations. For example, independent Claim 18 recites, at least in part, "allocating a plurality of root nodes, one for each distinct element of said plurality of signatures," "determining an index value for a signature of said plurality of signatures" and "determining a status of a root node corresponding to said determined index value." In the Final Office Action, the Examiner asserts that *Kadashevich* discloses the above-referenced limitation(s) by referring to a stem of *Kadashevich* being an index of "0" if abstract and "1" if otherwise, the index value of *Kadashevich* being equated to a "status of a root node" (Final Office action, page 15). Applicant respectfully disagrees. *Kadashevich* discloses that a stem may be either a valid English word (e.g., 'permit') or an abstract word which are not valid words but to which suffixes may be added to form valid words (e.g., 'permiss,' which serves as a stem for 'permissive' and 'permission')(*Kadashevich*, column 16, lines 44-50). The Examiner also refers to column 44, lines 50-51 of *Kadashevich* for the apparent purpose of indicating that a base index of "0" is used if the stem is abstract or "1" otherwise (Final Office Action, page 15). *Kadashevich* also discloses nodes 30 which each represent a different character of a stem (*Kadashevich*, column 16, lines 50-53). Thus, the index values of *Kadashevich* referred to by the Examiner refer to a stem and not a node of the stem, in contrast to Applicant's claimed invention as recited by independent Claim 18 where the "status" is related to a "root node" of a signature.

Accordingly, for at least the reason discussed above, the cited reference does not teach or suggest all the claim limitations of independent Claim 18. Therefore, Applicant respectfully submits that Claims 18, and Claims 19-20 that depend therefrom, are in condition for allowance.

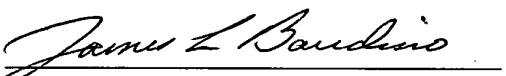
CONCLUSION

Applicant has demonstrated that the present invention as claimed is clearly distinguishable over the art cited of record. Therefore, Applicant respectfully requests the Board of Patent Appeals and Interferences to reverse the final rejection of the Examiner and instruct the Examiner to issue a notice of allowance of all claims

The Commissioner is authorized to charge the statutory fee of $500.00 to Deposit Account No. 08-2025 of Hewlett-Packard Company. Although no other fee is believed due, the Commissioner is hereby authorized to charge any fees or credit any overpayments to Deposit Account No. 08-2025 of Hewlett-Packard Company.

Respectfully submitted,

Date: March 24, 2005



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CLAIMS APPENDIX

1. A lexical search tree data structure, comprising:

a plurality of linked root nodes;

at least one branch linked to at least one of said plurality of root nodes, each branch along with the root node to which it is linked representing at least one of a plurality of signatures, a first character of each signature being represented by one of said plurality of root nodes; and

each branch having one or more leaf nodes linked hierachically to one another, each leaf node representing a character in a signature.

2. The lexical search tree data structure of claim 1, further comprising a twig linked to one of said leaf nodes and representing a substring of a second signature of said plurality of signatures, said second signature having at least the same first character as said first signature and said first and second signatures diverging from one another at said leaf node to which said twig is linked.

3. The lexical search tree data structure of claim 2, said twig comprising:

a twig node representing a first character of said substring, said twig node being at the same level as said leaf node to which said twig is linked; and

one or more leaf nodes, each leaf node representing a character of said substring.

4. The lexical search tree data structure of claim 1, wherein each of said plurality of signatures comprises a string of characters.

5. The lexical search tree data structure of claim 1, wherein the number of said root nodes is equal to the number of characters in a character set available to represent said plurality of signatures.

6. The lexical search tree data structure of claim 5, wherein said character set comprises the set of ASCII characters.

7. The lexical search tree data structure of claim 1, each root node comprising a hash value for the character represented by said root node.

8. The lexical search tree data structure of claim 7, each root node further comprising a pointer to a leaf node of said one or more leaf nodes if a first character of any of said plurality of signatures corresponds to said root node.

9. The lexical search tree data structure of claim 1, each leaf node having only one other leaf node directly linked to it at the next lower level.

10. The lexical search tree data structure of claim 1, further comprising a plurality of twigs linked to one of said leaf nodes, each twig of said plurality of twigs representing a substring of a different signature of said plurality of signatures.

11. A method for searching a plurality of signatures stored in a lexical search tree data structure, said method comprising:

determining a hash value for a target signature;

determining a branch associated with a root node of said lexical search tree data structure corresponding to said hash value, said branch along with said root node representing at least one signature of said plurality of signatures, said branch having one or more leaf nodes linked hierarchically to one another, each leaf node representing an element of said at least one signature; and

traversing only said branch to find a match between said at least one signature and said target signature.

12. The method of claim 11, said determining a hash value comprising:

determining a first element of said target signature; and

determining a hash value for said first element.

13. The method of claim 12, said hash value being the ASCII code for said first element.

14. The method of claim 11, said traversing only said branch comprising comparing successive elements of said target signature with successive elements of said at least one signature stored in successive leaf nodes of said one or more leaf nodes so long as said successive elements of said target signature match said successive elements of said at least one signature.

15. The method of claim 11, said traversing only said branch further comprising:

determining a twig associated with said branch at a point of divergence between said at least one signature and said target signature, said twig representing a terminating substring of a second signature of said plurality of signatures; and

traversing said twig to find a match between a terminating substring of said target signature and said terminating substring represented by said twig.

16. The method of claim 15, said traversing said twig comprising comparing successive elements of said terminating substring of said target signature with successive elements of said terminating substring of said second signature represented by said twig so long as successive elements match.

17. The method of claim 14, said traversing only said branch further comprising:

setting a current node pointer to point to a leaf node of said one or more leaf nodes;

setting a target signature pointer to point to an element of said target signature; in response to a value of said leaf node pointed to by said current node pointer being equal to a wild card character and a value of the element pointed to by said target signature pointer being equal to a value of the next leaf node following the leaf node pointed to by said current node pointer, updating said current node pointer to point to a leaf node following said next leaf node.

18. A method for representing a plurality of signatures in a lexical search tree data structure, comprising:

a) allocating a plurality of root nodes, one for each distinct element of said plurality of signatures;

b) determining an index value for a signature of said plurality of signatures;

c) determining a status of a root node corresponding to said determined index value, said root node being selected from said plurality of root nodes and representing a first element of said signature;

d) creating a branch for said root node if said root node has no existing branch, said branch having one or more leaf nodes linked hierarchically to one another, each successive leaf node representing a successive element of said signature;

e) creating a twig for said root node if said root node has an existing branch, said twig linked to one of said leaf nodes and representing a substring of said signature, the first element of said substring being represented by a twig node linked to said one of said leaf nodes; and

f) repeating steps (b) through (e) for each signature of said plurality of signatures.

19. The method of claim 18, said determining index value comprising:

determining a first element of said signature; and

determining an ASCII code for said first element.

20. The method of claim 18, said creating said twig comprising:

determining the location of said one of said leaf nodes from which said twig diverges.